Analyzing State-Based Silver Alert Programs: The Case of North Carolina

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Abstract
Silver Alert policies have been implemented in more than half of U.S. states over the last 5 years. However, no research to date has examined whether such policies are utilized according to the missions of addressing problems of missing older adults and adults with cognitive impairments. We use data from 2008, 2009, and 2010 Silver Alerts activated in North Carolina (n = 587) to assess the utilization patterns using regression and exploratory spatial analyses. Activation of alerts was not associated with the proportion of older population. Additionally, the activations of alerts were geographically unequally clustered around the North Carolina’s political centers. We suggest more detailed record keeping of individual silver alert cases to critically evaluate the silver alert policy.

Introduction
The older population has rapidly grown in recent decades, and in turn, age-related health problems as such dementia have become key public health concerns in the U.S.

Programs designed to support the safety and autonomy of adults with cognitive disability and/or dementia are in demand.

One such program, Silver Alerts (SA) program, has been widely implemented and at rapid pace, likely due to having a comparatively modest cost when addressing safety issues for individuals with dementia (Carr et al, 2010).

As of August 2010, 29 states implemented SA programs or plans to do so, whereas no systematic evaluation have been done despite the substantial dedication of resource.

The public health system performance conceptual model (Handler et al, 2001) shows the missions of (1) equally reaching target populations; (2) efficiently utilizing available resources; and (3) functioning as a public health system (e.g., monitoring a health problem) to address a public health concern.

Suggested by the Handler et al conceptual model, a critical review of utilization patterns according to the SA program missions as means to address safety issues of older adults and adults with cognitive impairment is needed.

Methods
Three years (2008, 2009 & 2010) of SA data, which are the only publically available data are obtained from the North Carolina (NC) Department of Crime Control and Public Safety.

Detaileindividual and county-level data are derived from multiple sources (e.g., online news archive; U.S. census bureau; County Health Rankings)

The unit of analysis is county due to limited information available at individual-level and consideration to personal privacy.

Geographic Information System (GIS)-based analysis: data visualization to understand utilization patterns across counties in NC.

Statistical analysis: negative binomial regression is used to model the count of SA activated as a function of county total population, percent older population, percent African American, median income, percent college educational attainment, mental health indicator (mean of self-reported days mental health was poor) and rural areas.

The preliminary analysis results show overdispersion (i.e., a violation of Poisson regression model assumption) and suggest negative binomial model as a reasonable alternative.

Analysis of geographically referenced data (e.g., county-level data) needs to incorporate spatial autocorrelation (i.e., the count of SA are similar in neighboring counties) into statistical model.

However, to date, no software is capable of adjusting for spatial autocorrelation in the negative binomial regression model.

Therefore, this study separates the exploratory spatial analysis and standard regression analysis.

Results
There were 587 Silver Alerts issued during 2008 (n = 128), 2009 (n = 239) and 2010 (n = 220).

The summary statistics of counties in NC are reported in Table 1.

Significant variability in all measures are observed across counties. Particularly, the total county population (4,078 of Tyrrell county; 913,639 of Wake county) and % African American (0.7% of Mitchell county; 62% of Hertford county) are noteworthy.

Results of negative binomial regression analysis show that only county total population and the percent African American are the statistically significant predictors of the SA count at the county-level.

The expected changes in log SA count for a one unit increase in the percent African American is 0.03.

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Figure 1 shows the disproportionate distributions of SA count concentrating around Wake county (SA count = 85) areas.

Figure 2 supports the visual examination of Figure1 and suggests “distance decay” effects of SA count. In other words, as moving away from Wake county where the SA was activated most often, the count of SA decreased on average.

Discussion
County-level utilization patterns in alert activations during 2008, 2009 and 2010 were not associated with proportion of the older population or the indicator of mental health across the state despite its mission to help missing older adults and adults with dementia or cognitive impairment in the legislation.

In light of Handler et al conceptual model, structural capacity, which is available resources as media outlets (e.g., TV station, radio station) may be associated with the inconsistent utilization patterns of SA programs.

The percent African American is possibly an indicator of mental health disparities as racial minority groups are more likely to have mental health issues (Alzheimer’s Association, 2010).

The limitations in this study include that potentially important measures such as county-level prevalence rates of dementia were unavailable and the findings are limited to county-level and only first three years of SA program in NC.

Detailed record-keeping and ongoing critical evaluation are needed to assess contributions of the SA program as a means to address public health issues of missing adults.

References available upon request

Table 1: Descriptive summary of counties in North Carolina

<table>
<thead>
<tr>
<th>Measures</th>
<th>Min</th>
<th>1st Qu.</th>
<th>Med</th>
<th>3rd Qu.</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total population in 2000</td>
<td>3,014</td>
<td>16,055</td>
<td>30,870</td>
<td>40,126</td>
<td>161,085</td>
</tr>
<tr>
<td>Percentage 60 and older</td>
<td>16.0%</td>
<td>3.7%</td>
<td>7.3%</td>
<td>14.6%</td>
<td>24.8%</td>
</tr>
<tr>
<td>Median income</td>
<td>41,808</td>
<td>7,086</td>
<td>29,043</td>
<td>65,487</td>
<td></td>
</tr>
<tr>
<td>Percent Black</td>
<td>21.2%</td>
<td>16.5%</td>
<td>6.0%</td>
<td>63.6%</td>
<td></td>
</tr>
<tr>
<td>Percent college education</td>
<td>16.1%</td>
<td>7.0%</td>
<td>8.2%</td>
<td>51.5%</td>
<td></td>
</tr>
<tr>
<td>Mean mental health days</td>
<td>3.43</td>
<td>0.6%</td>
<td>1.8%</td>
<td>6.7%</td>
<td></td>
</tr>
<tr>
<td>Rural areas</td>
<td>21.0%</td>
<td></td>
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</table>

Table 2: Estimated coefficients, standard errors and p-value in negative binomial regression on the number of SA during 2008, 2009 and 2010

<table>
<thead>
<tr>
<th>Measures</th>
<th>Coef</th>
<th>SE</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total population in 2000</td>
<td>0.242</td>
<td>0.053</td>
<td>0.001</td>
</tr>
<tr>
<td>Percentage 60 and older</td>
<td>0.045</td>
<td>0.024</td>
<td>0.185</td>
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<tr>
<td>Median income</td>
<td>-0.251</td>
<td>0.856</td>
<td>0.770</td>
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<tr>
<td>Percent Black</td>
<td>0.031</td>
<td>0.090</td>
<td>0.801</td>
</tr>
<tr>
<td>Percent college education</td>
<td>0.017</td>
<td>0.013</td>
<td>0.301</td>
</tr>
<tr>
<td>Mean mental health days</td>
<td>-0.082</td>
<td>0.446</td>
<td>0.706</td>
</tr>
<tr>
<td>Rural areas</td>
<td>-0.768</td>
<td>0.417</td>
<td>0.066</td>
</tr>
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Model fit:
- DI = 92
- R² = 0.645
- Deviance = 108.31

References available upon request